

UNITED STATES DEPARTMENT AGRICULTURE  
Rural Utilities Service

**BULLETIN 1753F-204(PE-7)**

**SUBJECT: RUS Specification for Aerial Service Wires**

TO: All Telecommunications Borrowers  
RUS Telecommunications Staff

**EFFECTIVE DATE:** June 24, 1996.

**EXPIRATION DATE:** Date of change in 7 CFR §§ 1755.700 through 1755.704 by rulemaking.

**OFFICE OF PRIMARY INTEREST:** Outside Plant Branch,  
Telecommunications Standards Division.

**PREVIOUS INSTRUCTIONS:** This bulletin replaces RUS Bulletin 345-36, RUS Specification for Parallel Conductor Drop Wire, PE-7, issued January 25, 1983.

**FILING INSTRUCTIONS:** Discard RUS Bulletin 345-36, RUS Specification for Parallel Conductor Drop Wire, PE-7, dated January 25, 1983, and replace it with this bulletin. File with 7 CFR 1755. This bulletin is available to the RUS staff on RUSNET (text only) and can be accessed via Internet at <http://www.usda.gov/rus/home/home.htm>

**PURPOSE:** This specification covers RUS requirements for aerial service wires intended for aerial subscriber drops. This bulletin is a reformat of the text codified in 7 CFR 1755.700 through 7 CFR 1755.704 published at 61 FR 26073, dated May 24, 1996.

Every effort has been made to ensure the accuracy of this document. However, in case of discrepancies, the regulations at 7 CFR 1755.700 through 7 CFR 1755.704 are the authorized sources.

Wally Beyer  

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Administrator

8/22/96  

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Date

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**ABBREVIATIONS**

ANSI	American National Standards Institute
CCSR	Copper Coated Steel Reinforced
dc	Direct current
FEXT	Far-end crosstalk loss
ICEA	Insulated Cable Engineers Association, Inc.
in.	Inches
mm	Millimeter
NEXT	Near-end crosstalk loss
NMR	Nonmetallic Reinforced
RUS	Rural Utilities Service

**1. SCOPE**

**1.1** This specification covers the requirements for aerial service wires intended for aerial subscriber drops.

**1.2** The aerial service wires can be either copper coated steel reinforced or nonmetallic reinforced designs.

**1.3** For the copper coated steel reinforced design, the reinforcing members are the conductors.

**1.3.1** The conductors are solid copper-covered steel wires.

**1.3.2** The wire structure is completed by insulating the conductors with an overall extruded plastic insulating compound.

**1.4** For the nonmetallic reinforced design, the conductors are solid copper individually insulated with an extruded solid insulating compound.

**1.4.1** The insulated conductors are either layed parallel (two conductor design only) or twisted into pairs (a star-quad configuration is permitted for two pair wires).

**1.4.2** The wire structure is completed by the application of nonmetallic reinforcing members and an overall plastic jacket.

**1.5** All wires sold to RUS borrowers for projects involving RUS loan funds under this specification must be accepted by RUS Technical Standards Committee "A" (Telecommunications). For wires manufactured to this specification, all design changes to an accepted design must be submitted for acceptance. RUS will be the sole authority on what constitutes a design change.

**1.6** Materials, manufacturing techniques or wire designs not specifically addressed by this specification may be allowed if accepted by RUS. Justification for acceptance of modified materials, manufacturing techniques or wire designs must be provided to substantiate product utility and long term stability and endurance.

**1.7** Copies of American National Standard Institute/Insulated Cable Engineers Association, Inc. (ANSI/ICEA) S-89-648-1993, "Standard For Telecommunications Aerial Service Wire, Technical Requirements," as referenced in this specification can be obtained from ICEA for a nominal fee at the address indicated below:

ICEA, Inc.  
P. O. Box 440  
South Yarmouth, Massachusetts 02664  
Telephone No.: (508) 394-4424

**2. COPPER COATED STEEL REINFORCED (CCSR) AERIAL SERVICE WIRE**

**2.1 Conductors:**

**2.1.1** Each conductor shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 2.1 through 2.1.5.

**2.1.2** Factory joints in conductors shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 2.1.6.

**2.2 Conductor Insulation:**

**2.2.1** The raw materials used for conductor insulation shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 3.1.1.

**2.2.2** The raw materials shall be accepted by RUS prior to their use.

**2.2.3** The finished conductor insulation shall be free from holes, splits, blisters, or other imperfections and shall be as smooth as is consistent with best commercial practice.

**2.2.4** The finished conductor insulation shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 3.1.5 through 3.1.5.4.

**2.2.5** The insulation shall have a minimum spot thickness of not less than 0.9 millimeters (mm) (0.03 inches (in.)) at any point.

**2.3 Wire Assembly:**

**2.3.1** The two conductors shall be insulated in parallel to form an integral configuration.

**2.3.2** The finished wire assembly shall be either a flat or a notched oval. Other finished wire assemblies may be used provided that they are accepted by RUS prior to their use.

**2.3.3** The overall dimensions of the finished wire assembly shall be in accordance with the following requirements:

<u>Diameter</u>	Dimensions			
	Minimum		Maximum	
	<u>mm</u>	<u>(in.)</u>	<u>mm</u>	<u>(in.)</u>
Major	5.5	(0.22)	8.0	(0.31)
Minor	3.0	(0.12)	5.0	(0.19)

**2.4 Conductor Marking:** The insulated conductors of a finished wire shall be marked in accordance with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 3.1.4.

**2.5 Electrical Requirements:**

**2.5.1 Conductor Resistance:** The direct current (dc) resistance of each conductor in a completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.2.

**2.5.2 Wet Mutual Capacitance:** The wet mutual capacitance of the completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.3.

**2.5.3 Wet Attenuation:** The wet attenuation of the completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.4.

**2.5.4 Wet Insulation Resistance:** The wet insulation resistance of the completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.5.

**2.5.5 Dielectric Strength:**

**2.5.5.1** The wet dielectric strength between conductors and between each conductor of the completed CCSR aerial service wire and the surrounding water shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.6.

**2.5.5.2** The dry dielectric strength between conductors of the completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.7.

**2.5.6 Fusing Coordination:** The completed CCSR aerial service wire shall comply with the fusing coordination requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.8.

**2.5.7 Insulation Imperfections:** Each length of completed CCSR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.1.9.

**2.6 Mechanical Requirements:**

**2.6.1 Impact Test:**

**2.6.1.1** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the unaged impact test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.2.

**2.6.1.2** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the aged impact test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.3.

**2.6.2 Abrasion Resistance Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the abrasion resistance test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.4.

**2.6.3 Static Load Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the static load test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.5.

**2.6.4 Plasticizer Compatibility Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the plasticizer compatibility test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.8.

## **2.7 Environmental Requirements:**

### **2.7.1 Cold Temperature Handling Test:**

**2.7.1.1** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the unaged cold temperature handling test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.2.1.

**2.7.1.2** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the aged cold temperature handling test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.2.2.

**2.7.2 Light Absorption Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the light absorption test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.2.3.

**2.7.3 Low Temperature Separation Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the low temperature separation test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.2.4.

**2.7.4 Flammability Test:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the flammability test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.3.

**2.7.5 Wire Listing:** All CCSR aerial service wires manufactured in accordance with Paragraph 2 of this specification shall comply with the listing requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 8.4.

**2.8 Identification Marker:** Each length of CCSR aerial service wire shall be identified in accordance with ANSI/ICEA S-89-648-1993, Paragraph 9.1.4. When surface marking is employed, the color of the initial marking shall be either white or silver.

**2.9 Length Marking (Optional):**

**2.9.1** Sequentially numbered length marking of the completed CCSR aerial service wire may be used at the option of the manufacturer unless specified by the end user.

**2.9.2** When sequentially numbered length markings are used, the length markings shall be in accordance with ANSI/ICEA S-89-648-1993, Paragraph 9.1.5. The color of the initial marking shall be either white or silver.

**2.10 Durability of Marking:** The durability of the marking of the CCSR aerial service wire shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 9.1.6.

**3. NONMETALLIC REINFORCED (NMR) AERIAL SERVICE WIRE**

**3.1 Conductors:**

**3.1.1** Each conductor shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 2.2 through 2.2.1.

**3.1.2** Factory joints in conductors shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 2.2.2.

**3.2 Conductor Insulation:**

**3.2.1** The raw materials used for conductor insulation shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 3.2 through 3.2.2.

**3.2.2** The finished conductor insulation shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 3.2.3.

**3.2.3** The dimensions of the insulated conductor shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 3.2.3.1.

**3.2.4** The colors of the insulation shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 3.2.3.2.

**3.2.5** A permissible overall performance level of faults in conductor insulation shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 3.2.4.6. The length count and the number of faults shall be recorded. The information shall be retained for a period of 6 months and be available for review by RUS when requested.

**3.2.6** Repairs to the conductor insulation during manufacture are permissible. The method of repair shall be accepted by RUS prior to its use. The repaired insulation shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 3.2.3.3.

**3.2.7** All repaired sections of insulation shall be retested in the same manner as originally tested for compliance with Paragraph 3.2.5 of this specification.

**3.2.8** The colored insulating material removed from or tested on the conductor, from a finished wire shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 3.2.4 through 3.2.4.5.

**3.3 Identification of Pairs and Layup of Pairs:**

**3.3.1** The insulation shall be colored coded to identify:

- a. The tip and ring conductor of each pair; and
- b. Each pair in the completed wire.

**3.3.2** The colors to be used in the pairs together with the pair numbers shall be in accordance with the table specified in ANSI/ICEA S-89-648-1993, Paragraph 4.1.1.

**3.3.3** The finished insulated conductors shall be either layed parallel (two conductor design only) or twisted into pairs.

**3.3.4** When using parallel conductors for the two conductor design, the parallel conductors shall be designed to enable the wire to meet the electrical requirements specified in Paragraph 3.7 of this specification.

**3.3.5** When twisted pairs are used, the following requirements shall be met:

**3.3.5.1** The pair twists shall be designed to enable the wire to meet the electrical requirements specified in Paragraph 3.7 of this specification; and

**3.3.5.2** The average length of pair twists in any pair in the finished wire, when measured on ant 3 meter (10 foot) length, shall not exceed the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 4.1.

**3.3.6** An alternative method of forming the two-pair wire is the use of a star-quad configuration.

**3.3.6.1** The assembly of the star-quad shall be such as to enable the wire to meet the electrical requirements specified in Paragraph 3.7 of this specification.

**3.3.6.2** The star-quad configuration shall be assembled in accordance with ANSI/ICEA S-89-648-1993, Paragraph 4.1.2.

**3.3.6.3** The average length of twist for the star-quad in the finished wire, when measured on a 3 meter (10 foot) length, shall not exceed the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 4.1.

**3.3.6.4** The color scheme used to provide identification of the tip and ring conductors of each pair in the star-quad shall comply with the table specified in ANSI/ICEA S-89-648-1993, Paragraph 4.1.2.

**3.4 Strength Members:** The strength members shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 6.1 and 6.1.1.

**3.5 Wire Jacket:**

**3.5.1** The jacket shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 5.1 and 5.1.1.

**3.5.2** The jacket raw materials shall be accepted by RUS prior to their use.

**3.6 Wire Assembly:** The finished wire assembly shall be in accordance with ANSI/ICEA S-89-648-1993, Paragraph 5.1.3 and Figure 5-1.

**3.7 Electrical Requirements:**

**3.7.1 Conductor Resistance:** The dc resistance of each conductor in a completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.2.

**3.7.2 Resistance Unbalance:**

**3.7.2.1** The dc resistance unbalance between the two conductors of any pair in a completed NMR aerial service wire and the average resistance unbalance of all pairs in a Quality Control Lot shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.3.

**3.7.2.2** The resistance unbalance between tip and ring conductors shall be random with respect to the direction of unbalance. That is, the resistance of the tip conductors shall not be consistently higher with respect to the ring conductors and vice versa.

**3.7.3 Dry Mutual Capacitance:** The dry mutual capacitance of the completed NMR aerial service wire shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.4., Type 1.

**3.7.4 Pair-to-Pair Capacitance Unbalance:** The pair-to-pair capacitance unbalance as measured on the completed NMR aerial service wire shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.5.

**3.7.5 Attenuation:**

**3.7.5.1** The dry attenuation of the completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.7.

**3.7.5.2** The wet attenuation of the completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.8.

**3.7.6 Insulation Resistance:**

**3.7.6.1** The dry insulation resistance of the completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.9.

**3.7.6.2** The wet insulation resistance of the completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.10.

**3.7.7 Wet Dielectric Strength:** The wet dielectric strength between conductors and between each conductor of the completed NMR aerial service wire and the surrounding water shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.11.

**3.7.8 Fusing Coordination:** The completed NMR aerial service wire shall comply with the fusing coordination requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.13.

**3.7.9 Crosstalk Loss:**

**3.7.9.1** The output-to-output far-end crosstalk loss (FEXT) for any pair of completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.14.

**3.7.9.2** The input-to-input near-end crosstalk loss (NEXT) for any pair of completed NMR aerial service wire shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 7.2.14.

**3.8 Mechanical Requirements:**

**3.8.1 Impact Test:**

**3.8.1.1** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the unaged impact test specified in Paragraph 2.6.1.1 of this specification.

**3.8.1.2** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the aged impact test specified in Paragraph 2.6.1.2 of this specification.

**3.8.2 Abrasion Resistance Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the abrasion resistance test specified in Paragraph 2.6.2 of this specification.

**3.8.3 Static Load Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the static load test specified in Paragraph 2.6.3 of this specification.

**3.8.4 Elongation Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the elongation test specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.7.

**3.8.5 Plasticizer Compatibility Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the plasticizer compatibility test specified in Paragraph 2.6.4 of this specification.

**3.9 Environmental Requirements:**

**3.9.1 Cold Temperature Handling Test:**

**3.9.1.1** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the unaged cold temperature handling test specified in Paragraph 2.7.1.1 of this specification.

**3.9.1.2** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the aged cold temperature handling test specified in Paragraph 2.7.1.2 of this specification.

**3.9.2 Light Absorption Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the light absorption test specified in Paragraph 2.7.2 of this specification.

**3.9.3 Flammability Test:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the flammability test specified in Paragraph 2.7.4 of this specification.

**3.9.4 Wire Listing:** All NMR aerial service wires manufactured in accordance with Paragraph 3 of this specification shall comply with the listing requirements specified in Paragraph 2.7.5 of this specification.

**3.10 Ripcord (Optional):**

**3.10.1** A ripcord may be used in the NMR aerial service wire structure at the option of the manufacturer unless specified by the end user.

**3.10.2** When a ripcord is used it shall comply with the requirements specified in ANSI/ICEA S-89-648-1993, Paragraphs 4.2 through 4.2.3.

**3.11 Identification Marker:** Each length of NMR aerial service wire shall be identified in accordance with ANSI/ICEA S-89-648-1993, Paragraphs 9.1 through 9.1.4. When surface marking is employed, the color of the initial marking shall be either white or silver.

**3.12 Length Marking (Optional):**

**3.12.1** Sequentially numbered length marking of the completed NMR aerial service wire may be used at the option of the manufacturer unless specified by the end user.

**3.12.2** When sequentially numbered length markings are used, the length markings shall be in accordance with Paragraph 2.9.2 of this specification.

**3.13 Durability of Marking:** The durability of the marking of the NMR aerial service wire shall comply with the requirements specified Paragraph 2.10 of this specification.

**4. REQUIREMENTS APPLICABLE TO BOTH CCSR AND NMR AERIAL SERVICE WIRES**

**4.1 Acceptance Testing:**

**4.1.1** The tests described in this specification are intended for acceptance of wire design and major modifications of accepted designs. What constitutes a major modification is at the discretion of RUS. These tests are intended to show the inherent capability of the manufacturer to produce wire products having long life and stability.

**4.1.2** For initial acceptance, the manufacturer shall:

- a. Certify that the product fully complies with each paragraph of this specification;
- b. Agree to periodic plant inspections by RUS;
- c. Certify whether the product complies with the domestic origin manufacturing provisions of the "Buy American" requirements of the Rural Electrification Act of 1938 (7 U.S.C. 903 note), as amended (the "REA Buy-American provision");
- d. Submit at least three written user testimonials concerning field performance of the product; and
- e. Provide any other nonpropriety data deemed necessary by the Chief, Outside Plant Branch (Telecommunications).

**4.1.3** In order for RUS to consider a manufacturer's request that a product be requalified, the manufacturer shall certify not later than June 30 of the year in which requalification is required, that the product:

- a. Fully complies with each paragraph of this specification; and
- b. Does or does not comply with the domestic origin manufacturing provisions of the REA Buy American provisions. The required certifications shall be dated within 90 days of the submission.

**4.1.4** Initial and requalification acceptance requests should be addressed to: Chairman, Technical Standards Committee "A" (Telecommunications), Telecommunications Standards Division, Rural Utilities Service, Stop 1598, Washington, DC 20250-1598.

## **4.2 Extent of Testing:**

### **4.2.1 Tests on 100 percent of completed wire:**

**4.2.1.1** Each conductor in the completed CCSR and NMR aerial service wire shall be tested for continuity in accordance with ANSI/ICEA S-89-648-1993, Paragraphs 7.1.1 and 7.2.1, respectively;

**4.2.1.2** Each conductor in the completed CCSR and NMR aerial service wire shall be tested for shorts in accordance with ANSI/ICEA S-89-648-1993, Paragraphs 7.1.1 and 7.2.1, respectively; and

**4.2.1.3** Each length of completed CCSR and NMR aerial service wire shall be tested for insulation imperfections in accordance Paragraph 2.5.7 and Paragraph 3.2.5 of this specification, respectively.

**4.2.2 Capability Tests:** Tests on a quality assurance basis shall be made as frequently as is required for each manufacturer to determine and maintain compliance with:

**4.2.2.1** Performance of the conductors;

**4.2.2.2** Performance of the conductor insulation and jacket material;

**4.2.2.3** Sequential marking and lettering;

**4.2.2.4** Mutual capacitance, capacitance unbalance, attenuation, and crosstalk;

**4.2.2.5** Conductor resistance, resistance unbalance, and insulation resistance;

**4.2.2.6** Dielectric strength and fusing coordination;

**4.2.2.7** Impact, abrasion, static load, elongation, and plasticizer compatibility tests; and

**4.2.2.8** Cold temperature handling, light absorption, low temperature separation, and flammability tests.

### **4.3 Summary of Records of Electrical and Physical Tests:**

**4.3.1** Each manufacturer shall maintain suitable summary of records for a period of at least 3 years for all electrical and physical tests required on completed wire as set forth in Paragraph 4.2 of this specification. The test data for a particular lot of aerial service wire shall be in a form such that it may be readily available to the purchaser or to RUS upon request.

**4.3.2** Measurements and computed values shall be rounded off to the number of places or figures specified for the requirement according to ANSI/ICEA S-89-648-1993, Paragraph 1.3.

**4.4 Manufacturing Irregularities:**

**4.4.1** Repairs to the insulation of CCSR aerial service wires are not permitted in wires supplied to end users under this specification.

**4.4.2** Repairs to the jacket of NMR aerial service wires are not permitted in wires supplied to end users under this specification.

**4.5 Splicing:** Splicing of completed CCSR and NMR aerial service wires shall comply with the requirement specified in ANSI/ICEA S-89-648-1993, Paragraph 8.1.1.

**4.6 Preparation For Shipment:**

**4.6.1** CCSR and NMR aerial service wire shall be shipped either in coils or on reels.

**4.6.2** When CCSR and NMR aerial service wires are shipped on reels the following provisions shall apply:

**4.6.2.1** The diameter of the drum shall be large enough to prevent damage to the wire from reeling and unreeling. The reels shall be substantial and so constructed as to prevent damage to the wire during shipment and handling;

**4.6.2.2** A waterproof corrugated board or other suitable means of protection accepted by RUS prior to its use may be applied to the reel. If the waterproof corrugated board or other suitable material is used for protection, it shall be suitably secured in place to prevent damage to the wire during storage and handling. The use of the waterproof corrugated board or other suitable means of protection shall be at the option of the manufacturer unless specified by the end user;

**4.6.2.3** The outer end of the wire shall be securely fastened to the reel head so as to prevent the wire from becoming loose in transit. The inner end of the wire shall be securely fastened in such a way as to make it readily available if required for electrical testing. Spikes, staples, or other fastening devices which penetrate the conductor insulation of the CCSR aerial service wire and jacket of the NMR aerial service wire shall not be used. The method of fastening the wire ends shall be accepted by RUS prior to their use;

**4.6.2.4** Each length of wire shall be wound on a separate reel;

**4.6.2.5** Each reel must be plainly marked to indicate the direction in which it should be rolled to prevent loosening of the wire on the reel; and

**4.6.2.6** Each reel shall be stenciled or labeled on either one or both sides with the following information:

- a. Customer order number;
- b. Manufacturer's name and product code;
- c. Factory reel number and year of manufacture;
- d. Gauge of conductors and pair size of wire;
- e. Length of wire; and
- f. RUS designation letter "K".

**4.6.3** When CCSR and NMR aerial service wires are shipped in coils the following provisions shall apply:

**4.6.3.1** The diameter of the coil shall be large enough to prevent damage to the wire from coiling and uncoiling;

**4.6.3.2** The nominal length of the wire in a coil shall be 305 meters (1,000 feet). No coil shall be less than 290 meters (950 feet) long or more than 460 meters (1,500 feet) long; however, 25 percent of the total number of coils may be less than 305 meters (1,000 feet);

**4.6.3.3** The coils of wire shall be wound securely with strong tape in four separate evenly spaced places;

**4.6.3.4** The coils may be protected from damage by wrapping the coil with heavy paper, burlap, or other suitable material accepted by RUS prior to its use. The use of the heavy paper, burlap, or other suitable means of protection shall be at the option of the manufacturer unless specified by the end user; and

**4.6.3.5** Each coil shall be tagged with the following information:

- a. Customer order number;
- b. Manufacturer's name and product code;
- c. Year of manufacture;
- d. Gauge of conductors and pair size of wire;
- e. Length of wire; and
- f. RUS designation letter "K".

**4.6.4** In lieu of wrapping the coil with heavy paper, burlap, or other suitable material, the coil may be packaged in a moisture resistant carton.

**4.6.5** When the coils are shipped in moisture resistant cartons, each carton shall be marked with the information specified in Paragraph 4.6.3.5 of this specification.

**4.6.6** Other methods of shipment may be used if accepted by RUS prior to their use.

**4.6.7** When NMR aerial service wire is shipped, the ends of the wire shall be sealed in accordance with ANSI/ICEA S-89-648-1993, Paragraph 9.2.